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Levels of Naphthalene and Phenanthrene in seawater along the coastal belt from Colombo to Mirissa in Sri Lanka

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Polycyclic Aromatic Hydrocarbons (PAHs) are pervasive pollutants in marine and coastal settings. Naphthalene (NAP) and Phenanthrene (PHE) are among the sixteen PAHs recognized as priority pollutants by the United States Environmental Protection Agency. Due to their persistence, bioaccumulative capacity, and probable carcinogenicity, PAHs pose a serious threat to the health and wellbeing of humans when ingested. The present study was carried out to evaluate the levels of NAP and PHE in seawater along the coastal belt from Colombo to Mirissa, where coastal water pollution is considered to be high. Seawater samples collected from 19 distinct locations (n=3 each) along the selected area underwent HPLC analysis, followed by organic solvent extraction. Each of these locations provided three replicates, facilitating a reliable evaluation of the concentrations of NAP and PHE. The NAP concentration along the coastal belt was from 1.70 to 15.05 mg/L. The highest NAP concentration was recorded in Mirissa (15.05 ± 0.14 mg/L), followed by Galle Face, Bentota, Rathgama, Wellawatta, Gintota, Galle, Ambalangoda, Weligama, Kalutara, Unawatuna, Ratmalana, Moratuwa, Koggala, Hikkaduwa, Mount Lavinia, Panadura, and Wadduwa. In comparison, the lowest NAP concentration was detected in Dehiwala (1.70 ± 0.00 mg/L). The highest PHE concentration was recorded in Ambalangoda (5.36 ± 0.55 mg/L) followed by Mirissa, Galleface, Weligama, Rathgama, Gintota, Bentota, Galle, Koggala, Unawatuna, Hikkaduwa, Wellawatta, Dehiwala, Ratmalana, Wadduwa, Mount Lavinia, Panadura, and Moratuwa. However, PHE was not detected in Kalutara. Mirissa was heavily polluted, having the highest NAP concentration and the second highest concentration of PHE (5.25 ± 0.03 mg/L). The concentrations of NAP and PHE in all coastal water samples except Kalutara exceeded the maximum permissible concentration (\sum PAHs = 0.030 µg/L) stated by the Environmental Quality Criteria for the United States. The high concentrations of PAHs might be due to high oil and grease content caused by engine oil leaks from fishing boats and boat repair stations, infrequent oil and sludge spills from nearby industries, unintentional oil spills when refueling, and tributary inflows. Since NAP has a higher solubility in water, the concentration of NAP in seawater is higher than that of PHE. This study provides valuable information for EIA programs and contributes to developing effective strategies to mitigate PAH pollution in coastal waters. Broader studies are recommended to pinpoint the sources of PAHs and explore strategies for reducing environmental emissions.

Keywords: Coastal water, HPLC, Naphthalene, Phenanthrene, Polycyclic aromatic hydrocarbons.

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